

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14
(An Autonomous Institution - Affiliated to Madurai Kamaraj University)
Re-accredited (3rd Cycle) with Grade A⁺ & CGPA 3.51 by NAAC
CBCS with OBE
GENERIC ELECTIVE BOTANY
(For II B.Sc. Zoology
(W.e.f. 2022 – 2023 onwards)

COURSE STRUCTURE - SEMESTER WISE

Sem	Part	Sub Code	Title of the paper	Teaching hrs. (Per week)	Duration of exam (Hrs.)	Marks allotted			Credits
						CIA	SE	Total	
III	III	22OUZOGEB03	GEC: Botany – I Plant Diversity- I	4	3	25	75	100	4
			GEC: Botany Practical I - Plant Diversity – I & Basics of Botany	2	-	-	-	-	-
IV	III	22OUZOGEB04	GEC: Botany – II Basics of Botany	4	3	25	75	100	4
		22OUZOGEB04P	GEC: Botany Practical I – Plant Diversity - I & Basics of Botany	2	3	40	60	100	1
V	III	22OUZOGEB05	GEC: Botany – III Taxonomy of Angiosperms & Plant Pathology	4	3	25	75	100	4
		22OUZOGEB06P	GEC: Botany Practical II - Taxonomy of Angiosperms & Plant Pathology and Applied Botany	2	-	-	-	-	-
VI	III	22OUZOGEB06	GEC: Botany –IV Applied Botany	4	3	25	75	100	4
		22OUZOGEB06P	GEC: Botany Practical II – Taxonomy of Angiosperms & Plant Pathology and Applied Botany	2	3	40	60	100	1

Programme Specific Outcome (PSOs):

PSO	GRADUATE ATTRIBUTES	DESCRIPTION
PSO-1	Knowledge	Gain the ideas and arguments by collecting relevant information about the plants, so as to recognise their position in the classification systems and at the phylogenetic level.
PSO-2	Problem analysis	Students will be able to analyse Plants' function at cellular and tissue levels.
PSO-3	Problem Solving	Students will be able to compare and contrast the characteristics of the different groups of plants such as algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.
PSO-4	Modern tool usage	Ensure the use of contemporary tools and techniques in understanding the scope and significance of Botany. Apply appropriate techniques, resources, and modern ICT tools for understanding plant resources.
PSO-5	The graduate and society	Enhanced capacity to think and explore how botany is applied in a social context.
PSO-6	Environment and sustainability	Students will be able to communicate and collaborate within and outside of biology and tap into the interdisciplinary nature of science.
PSO-7	Ethics and values	Follow the concept of professional ethics and bioethics norms for practising the value of plant kingdom.
PSO-8	Leadership Quality & Communication	Communicate proficiently with various stakeholders and society, to comprehend and write and present reports effectively.

Nature of the Course

Courses are classified according to the following nature.

1. Knowledge and skill oriented
2. Employability oriented
3. Entrepreneurship-oriented

Outcome Based Education (OBE) & Assessment

Students' understanding must be built on and assessed for a wide range of learning activities, which includes different approaches and are classified along several bases, such as:

1. Based on purpose:

- Continuous Assessment (Internal Tests, Assignments, Seminars,
- Quizzes, Documentation, Case lets, ICT based Assignments, Mini projects administered during the learning process)
- External Assessment (Evaluation of students' learning at the end of the instructional unit)

2. Based on Domain Knowledge: (for UG Up to K4 levels)

Assessment through K1, K2, K3, & K4

Department of Zoology					Class : II B.Sc.			
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
I	Generic Elective: II	22OUZOGEB03	Plant Diversity - I	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To know the diversity of plant kingdoms and diverse groups of plants.
2. To understand the unique features and evolutionary importance of Algae.
3. To study the adaptive strategies of fungi and lichens.
4. To understand the evolutionary trends in Bryophyte, Pteridophyte and Gymnosperm.
5. To study the variations in anatomical patterns of the life cycle and its economic importance.

Course Content:**Unit I: Introduction to Plant Diversity**

Plant diversity – Concept, Plant Kingdom-Position of plants in five kingdom systems (Robert Whittaker) and Classification of plant kingdom Oswald Tippo 1942.

Algae: General Characters of Algae, Economic importance, Occurrence, Cell Structure and Life Cycle Pattern of: -

- | | |
|------------------------------------|---------------------------------------|
| a. Cyanophyceae - <i>Spirulina</i> | b. Chlorophyceae - <i>Oedogonium</i> |
| c. Phaeophyceae - <i>Sargassum</i> | d. Rhodophyceae - <i>Polysiphonia</i> |

Unit II: Fungi - General Characters, Economic importance, Occurrence, Cell Structure and Life Cycle Pattern of: -

- | | |
|-------------------------------------|-------------------------------------|
| a. Phycomycetes – <i>Mucor</i> | b. Ascomycetes – <i>Aspergillus</i> |
| c. Basidiomycetes – <i>Puccinia</i> | d. Lichens – <i>Usnea</i> |

Unit III: Bryophytes - General Character, Economic Importance, Structure and Life Cycle Pattern of *Marchantia*.

Unit IV: Pteridophytes - General Character, Economic Importance, Structure and Life Cycle Pattern of *Azolla*.

Unit V: Gymnosperms - General Character, Economic importance, Structure, Anatomy of Leaf and Life Cycle Pattern of *Cycas*.

Note: Sexual organ development need not be discussed for any organisms in the above Units. Schematic representation of the Life Cycle only is discussed.

Books for Study:

1. Annie Ragland, V. Kumaresan, V, and Arumugam, N. Algae, Fungi, Bryophytes, Microbiology and Plant Pathology, Saras Publication, Nagercoil, (2021).
3. Pandey, S.N., Misra, S.P. and Trivedi, P.S. *A textbook of Botany Volume -II*. Vikas Publishing House Pvt. Ltd. New Delhi, (2016).
4. Vashishta, P.C. Sinha, A.K. and Anilkumar. Botany for Degree Students, Gymnosperms, S.Chand & Company Pvt. Ltd. New Delhi, (2016).

Reference Books:

1. Bendre, M. and Kumar, A textbook of Practical Botany I. Rastogi Publications, Meerut, (2009-2010).
2. Reddy, S.M. University Botany I: *Algae Fungi, Bryophyta and Pteridophyta*. New Age International Pvt. Ltd. New Delhi, (2001).
3. Sambamurthy, A.V.S.S. *A TextBook of Algae*. I.K. International Pvt. Ltd. New Delhi, (2005).
4. Soni, N.K. and Soni, V. *Fundamentals of Botany Vol. I*. Tata McGraw-Hill. Education Pvt. Ltd. New Delhi, (2010).

Web Resources/ e-Books:

1. <https://www.slideshare.net/vijisri1/introduction-to-algal-classification-part1>
2. <https://www.slideshare.net/marchantia-drsvijaya-emg-yadava-womens-college>
3. <https://youtu.be/fsbIKRDk6TM>
4. <https://www.biologydiscussion.com/algae/algae-characteristics-and-structureefinition-characteristics-and-structure-with-diagram/46727>
5. www.freebookcentre.net/Biology/Botany-Books.html

Pedagogy:

Chalk and Talk, PowerPoint presentations, Seminar, Group Discussions, and Quizzes through ICT-Mode.

The rationale for the nature of the Course:

Knowledge and Skill:

Students can recall the biodiversity of plants, and understand the knowledge about habits, structure, anatomy, life cycle patterns and economic importance of Algae, Fungi, Bryophyte and Gymnosperm.

Activities to be given:

Lab activity is given to students to compare different types and characteristic features among algae and fungi. Assign a case study about the exploitation of Pteridophyte and Gymnosperms as ornamental plants.

Course learning Outcomes (CLOs):

CLO	Course Outcomes statements	Knowledge According to Bloom's Taxonomy
CLO 1	Understand the diversity of plants and different types of classifications in the plant kingdom.	K1 to K3
CLO 2	Acquire the evolutionary importance of Algae as progenitors of land plants	K1 to K3
CLO 3	Distinguish the life pattern of Plants and Fungi	K1 to K4
CLO 4	Identify Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms based on their morphology and anatomy	K1 to K3
CLO 5	Explore the potentialities of Plants and Fungi for mankind.	K1 to K4

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems.

K4- Examining, analysing, presenting and making inferences with evidence.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	3	1	1
CLO2	3	2	3	1	2	1
CLO3	3	2	2	2	2	1
CLO4	2	3	3	2	1	2
CLO5	3	3	2	2	2	1

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs.)

UNIT	DESCRIPTION	Hrs.	MODE
I	Introduction to Plant Diversity Plant diversity – Concept, Plant Kingdom- Position of plants in five kingdom systems (Robert Whittaker) and Classification of plant kingdom Oswald Tippo 1942. Algae: General Characters of Algae, Economic importance, Occurrence, Cell Structure and Life Cycle Pattern of: -	14	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Classes.

	a. Cyanophyceae - <i>Anabaena</i> b. Chlorophyceae - <i>Oedogonium</i> c. Phaeophyceae - <i>Sargassum</i> d. Rhodophyceae - <i>Polysiphonia</i>		
II	Fungi - General Characters, Economic importance, Occurrence, Cell Structure and Life Cycle Pattern of: - a. Phycomycetes – <i>Mucor</i> b. Ascomycetes – <i>Aspergillus</i> c. Basidiomycetes – <i>Puccinia</i> d. Lichens – <i>Usnea</i>	14	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.
III	Unit III: Bryophytes - General Character, Economic Importance, Structure and Life Cycle Pattern of <i>Marchantia</i> .	10	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.
IV	Pteridophytes - General Character, Economic Importance, Structure and Life Cycle Pattern of <i>Azolla</i> .	10	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.
V	Gymnosperms - General Character, Economic importance, Structure, Anatomy of Leaf and Life Cycle Pattern of <i>Cycas</i> .	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.

Course Designer
Dr.(Mrs.)V.Vijaya

Department of Zoology					Class : II B.Sc.			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
II	Generic Elective: II	22OUZOGEB04	Basics of Botany	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To know about plant cells, organelles, and their function.
2. To distinguish different types of plant tissues through their structural organization and functions.
3. To be familiar with Mendelian Principles of genetics.
4. To learn about the mechanism of photosynthesis, respiration and the role of phytohormones in plants.
5. To understand the reproduction in angiosperms.

Course Content:

Unit I: Cell Biology

Overall structure of a typical plant cell (Organelles & Inclusions), Prokaryotic & Eukaryotic cell difference (table form) – Structural organization and functions of Mitochondria and Chloroplast. Structure of Plasma-membrane (Unit membrane concept – Robertson; Fluid mosaic model – Singer and Nicolson)

Unit II: Plant Anatomy

Types of Meristems - Simple permanent tissue – a) Parenchyma b) Collenchyma

c) Sclerenchyma, Complex permanent tissue – a) Xylem b) Phloem (Meristematic

Theories need not be discussed). Differentiate Dicot & Monocot Root, Stem, and Leaf

(Table form). Secondary thickening in dicot stem.

Unit III: Genetics

Mendelian Principles – Explain the law of Dominance, Segregation, and Independent assortment. Mendel's Experiment on Pea plant – Monohybrid Cross, Dihybrid Cross, Back Cross, Test Cross and Incomplete Dominance.

Unit IV: Plant Physiology

Absorption of water -Types, **Transpiration** – Types, Mechanism of Transpiration.

Photosynthesis – Photosynthetic apparatus, Pigments and units, Mechanism of photosynthesis

- Light reaction (Cyclic and Non-cyclic photo phosphorylation) and Dark reaction (Kelvin

Cycle), **Respiration** – Types, Mechanism of Respiration - Glycolysis, Krebs Cycle in Mitochondria. **Plant Growth Hormones** – Physiological role of Auxins, Cytokinin and Gibberellins (chemical structure need not be discussed).

Unit V: Embryology

Structure and development of anther, structure and development of ovule, Types of Ovules, Female gametophyte (*Polygonum* type), double fertilization and triple fusion.

Books for Study: -

1. Annie Ragland, Kumaresan, V and Rajkumar, K. Plant Physiology & Environmental Biology. Vol 4: Saras Publication, (2015).
2. Annie Ragland, Kumaresan, V and Arumugam, N. Cell Biology, Anatomy and Microtechniques. Saras Publication, Nagercoil, (2015).
3. Gupta, P.K. *Genetics: A Textbook for University Students*. Rastogi Publication, Meerut, (2016).
4. Pandey, S. N. and Chadha, A. *Plant Anatomy and Embryology*, Vikas Publishing House Pvt. Ltd. New Delhi, (2017).

Reference Books:

1. Gupta, P.K. Cell Biology and Genetics, Rastogi Publications-Meerut, (2016).
2. Sinha, R.K. *Modern Plant Physiology*. Narosa Publishing House, New Delhi, (2004).
3. Singh, V. *Plant Anatomy and Embryology of Angiosperms*. Global Media, India, (2009).

Web Resource/e - Books:

1. www.freebookcentre.net/Biology/Botany-Books.html
2. <https://www.slideshare.net/vijisri1/biology-quiz-drvvijaya-assistant-professor-of-botany-emg-yadava-womens-college-madurai>
3. <https://www.biologyonline.com/tutorials/plant-cells-vs-animal-cells>
4. <https://uou.ac.in/sites/default/files/slm/BSCBO-202.pdf>
5. <https://www.biologydiscussion.com/genetics/mendels-principles-of-genetics/5221>
6. <https://www.biologydiscussion.com/notes/plant-physiology-notes/lecture-notes-on-plant-physiology/34647>

Pedagogy:

Chalk and Talk method, PowerPoint presentations, Seminar, Group Discussion, Quiz through ICT-Mode.

The rationale for the nature of the Course:

Knowledge and Skill:

Students can learn about Plant Cell structure and its organelles, tissues, and secondary growth, distinguish the anatomy of monocot and dicot, leaf, stem, root, primary and secondary growth, basics of genetics, and plant reproduction.

Activities to be given:

Lab activity is given to students to identify cells, organelles, and tissues, compare the monocot plant with the dicot plant and basic genetic problems, and Assign them a case study about plants having Secondary growth in the dicot stem.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy
CLO 1	Differentiate Structure and functions of cell organelles and cell membrane	K1 to K3
CLO 2	Illustrate the internal structure of plant tissue	K1 to K3
CLO 3	Interpret anomalous secondary growth in plants	K1 to K4
CLO 4	Compare the Mendelian inheritance and non-inheritance	K1 to K3
CLO 5	Distinguish the structure and development of microsporangium and megasporangium.	K1 to K4

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems.

K4- Examining, analysing, presenting and making inferences with evidence.

Mapping, of Course, Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	1	2	1
CLO2	3	2	3	1	2	1
CLO3	3	2	3	2	1	2
CLO4	3	3	3	2	1	2
CLO5	3	3	3	3	2	1

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs.)

UNIT	DESCRIPTION	Hrs.	MODE
I	Cell Biology Overall structure of a typical plant cell (Organelles & Inclusions), Prokaryotic & Eukaryotic cell difference (table form) – Structural organization and functions of Mitochondria and Chloroplast. Structure of Plasma-membrane (Unit membrane concept – Robertson; Fluid mosaic model – Singer and Nicolson)	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.

II	Plant Anatomy Types of Meristems - Simple permanent tissue – a) Parenchyma b) Collenchyma c) Sclerenchyma, Complex permanent tissue – a) Xylem b) Phloem (Meristematic theories need not be discussed). Differentiate Dicot & Monocot Root, Stem, and Leaf (Table form). Secondary thickening in dicot stem.	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.
III	Genetics Mendelian Principles – Explain the law of Dominance, Segregation and Independent assortment. Mendel's Experiment on Pea plant – Monohybrid Cross, Dihybrid Cross, Back Cross, Test Cross, and Incomplete Dominance.	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.
IV	Plant Physiology Absorption of water -Types, Transpiration – Types, Mechanism of Transpiration. Photosynthesis – Photosynthetic apparatus, Pigments and units, Mechanism of photosynthesis - Light reaction (Cyclic and Non-cyclic photo phosphorylation) and Dark reaction (Kelvin Cycle), Respiration – Types, Mechanism of Respiration - Glycolysis, Kerb's Cycle in Mitochondria. Plant Growth Hormones – Physiological role of Auxins, Cytokinin and Gibberellins.	14	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.
V	Embryology Structure and development of anther, structure and the development of ovule, Types of Ovules, Female gametophyte (<i>Polygonum</i> type), double fertilization and triple fusion.	10	Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class.

Course Designer
Dr.(Mrs.)V.Vijaya

Department of Zoology			Class: II B.Sc.					
Semester	Category	Course Code	Course Title	Credits	Hours	CIA	SE	Total
III & IV	Generic Elective – II	22OUZOGEB04P	Practical – Plant Diversity – I & Basics of Botany	1	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

1. Algae: Mounting and observation of thallus structure, anatomy and reproductive structure of - *Anabaena*, *Oedogonium*, *Sargassum*, *Polysiphonia*.
2. Fungus: Structure Examination using permanent slide - *Mucor*, *Aspergillus*, *Usnea* and *Puccinia*.
3. Bryophytes: Mounting and observation of thallus structure and Anatomy of *Marchantia*.
4. Pteridophyte: Mounting and observation of morphology and anatomy, thallus structure of *Azolla*.
5. Gymnosperm: Morphology, anatomy of leaf, male and female cones.
6. Cell Biology: Spotters – Plant Cell, cell organelles – Mitochondria and Chloroplast.
7. Plant Anatomy: Sectioning, Mounting, and identifying the internal structure of Dicot: Stem, Root, and Leaf and Secondary thickening in Dicot Stem.
8. Genetics: Simple problems - Monohybrid, Dihybrid, Test Cross, Back Cross and Incomplete Dominance.
9. Plant physiology: Demonstration of transpiration and photosynthesis with the help of suitable materials.
10. Embryology: Section and mounting of the anther and ovule. Observation of Permanent Slide for Embryo types.

Books for reference:

<https://biologywala.com/download-a-text-book-of-practical-botany-2-bendre-kumar-practical-botany-pdf-book/>

Pedagogy

Chalk and talk, laboratory practices, Sectioning and mounting of plant samples, group discussion.

LESSON PLAN FOR PRACTICAL (Total hours: 60)

S.No.	Description	Hours	Mode
1.	Algae: Mounting and observation of thallus structure, Anatomy and reproductive structure of - <i>Anabaena</i> , <i>Oedogonium</i> , <i>Sargassum</i> , <i>Polysiphonia</i> .	8	Demonstration, Chalk and Talk, Discussion
2.	Fungus: Structure Examination using permanent slide - <i>Mucor</i> , <i>Aspergillus</i> , <i>Usnea</i> and <i>Puccinia</i> .	8	Demonstration, Chalk and Talk, Discussion
3.	Bryophytes: Mounting and observation of thallus structure and Anatomy of <i>Marchantia</i> .	6	Demonstration, Chalk and Talk, Discussion
4.	Pteridophyte: Mounting and observation of Morphology and Anatomy, thallus structure of <i>Azolla</i> .	4	Demonstration, Chalk and Talk, Discussion
5.	Gymnosperm: Morphology, Anatomy of leaf, male and female cones.	4	Demonstration, Chalk and Talk, Discussion
6.	Cell Biology: Spotters – Plant Cell, cell organelles – Mitochondria and Chloroplast.	4	Demonstration, Chalk and Talk, Discussion
7.	Plant Anatomy: Sectioning, Mounting, and identifying the internal structure of Dicot: Stem, Root, and Leaf and Secondary thickening in Dicot Stem.	10	Demonstration, Chalk and Talk, Discussion
8.	Genetics: Simple problems - Monohybrid, Dihybrid, Test Cross, Back Cross and Incomplete Dominance.	6	Demonstration, Chalk and Talk, Discussion
9.	Plant Physiology: Demonstration of transpiration and photosynthesis with the help of suitable materials.	4	Demonstration, Chalk and Talk, Discussion
10.	Embryology: Section and Mounting of an anther, and Ovule. Observation of Permanent Slide - Embryo types.	6	Demonstration, Chalk and Talk, Discussion

Course Designer
Dr.(Mrs.)V.Vijaya

EVALUATION (PRACTICAL)

Internal (Formative)	: 40 marks
External (Summative)	: 60 marks
Total	:100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

S.No.	Components	Marks
1.	Dissection	10
2.	Spotter Identification	10
3.	Model exam	10
4.	Viva	10
	Total	40

Question Paper Pattern for External Practical Examination: 60 Marks

S.No.	Components	Marks
1.	Dissection	20
2.	Spotter Identification	20
3.	Viva	10
4.	Record book	10
	Total	60

In respect of external examinations passing minimum is **35% for Undergraduate Courses** and in total, an **aggregate of 40%**.

The latest amendments and revisions as per **UGC** and **TANSCH** norms are taken into consideration to suit the changing trends in the curriculum.